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THE PATHOGENIC POWER OF PURE SPORES OF ANTHRAX

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THE PATHOGENIC POWER OF PURE SPORES OF DAVAINE ANTHRAX

/Following is the translation of an article by J. Basset in the French-language publication Comptes Rendus Societe de Biologie (Reports of the Biological Society) Vol 77, No 92, Paris, 1925, pp 1515-1517./

Examination an 8 to 15 days old bouillon culture shows that in comparison with the filamentous forms, the proportion of spores is small (the genesis-inhibiting factor being here insufficient ventilation). If, instead of working with a natural anthrax (isolated from a case of natural anthrax disease) an old laboratory product is grown, or a vaccine, the proportion of spores is even much smaller. And it is understandable in these conditions that the results of inoculation are very variable because after some time the filamentous form of the anthrax loses its vitality and the endotoxine its properties.

On the other hand, since the memorable experiments of Vaillard, Vincent and Rouget with tetanus spores, it is known that the spores of anaerobic toxine-producing bacteria need necessarily to grow in tissue causing either a general disturbance of the organism or a local disturbance. Excepting ingestive experiments, analogous experiments never have been tried as far as I know with carbuncular virus, and authors speak indifferently of anthrax or spores.

I isolated from sheep in Uruguay the virus I use. It is a very pathogenic and lively sample that gives on slanting gelatine in 4 to 5 days a large harvest of spores with very few filamentous forms. An emulsion is made with salt water (10 cc per gelatine tube) and in sealed ampoules heated to 80 degrees centigrade during one hour to destroy the vitality and the toxicity of the myceleums.

Inoculation in the subcutaneous connective tissue. The inoculations with 1/4, 1/8, 1/16 cc provoke death in 2½ to 3 days and one could believe that the organism is as receptive to the spores as to the anthrax bacilli. But it is quite different. With 1/120, 1/100 cc all animals resist (10 guinea pigs of 600 grams). With 1/60 cc three of 10 died in 2½ to 3 days.

Intracutaneous inoculation. With 1/120 cc no infection followed. With 1/60 cc same proportion of death as in the subcutaneous connective tissue: three of 10 guinea pigs, but in a slightly longer time, 3½ to 4 days.

Application on the closely shaved or depilated skin. With 1/60 or 1/8 cc no infection.

Intra-muscular inoculation (muscles of the calf) through the skin. With 1/60 cc no obvious disturbance (5 guinea pigs); with 1/8 cc, one guinea pig of five died in three days.

Intra-peritoneal inoculation through the skin and the abdominal wall. With 1/60, 1/8, 1/2 cc all animals resisted. With 1 cc one guinea pig of four dead in 4½ days. The autopsy did not prove that this death was caused by leakage (fatal under these conditions) in subcutaneous connective tissue : no trace of under-abdominal edema, lymph glands of flank congestive, but not hemorrhagic, spleen enormous.

To summarize, the pure spores of Davaine anthrax are much less pathogenic than the anthrax itself.

The inoculations with spores confirm the results obtained with mixtures of spores and bacteria, but they permit judging those results more precisely. They prove that the skin is receptive--but a little less than the loose connective tissue--and that, as to the skin the connective tissue of mesodermal origin is definitely more receptive than the epithelium (of ectodermal origin) the only tissue belonging to the tegument proper /See Note/. They prove that the muscle is less receptive than the skin (and, a fortiori, less receptive than the loose connective tissue).

The peritoneum is even less receptive than the muscle. The pure spores are in comparison with the spores-bacteria mixture much easier to handle, they are a material of which the action can be measured exactly and can be kept without changing. They permit, without doubt, the making of vaccines of a superior practical value compared with the mixtures. I started research in this direction. In America, Eichhorn uses since 1915 a vaccine with spores that he heats to 60 degrees centigrade for 30 minutes to destroy the vitality of the myceliums. It is possible that the heating to 80 degrees which destroy not only the vitality of the anthrax, but also their endotoxine, contributes to the technical perfection.

(/Note/: H. Vallee has written this: "The facts altogether shown by Besredka and confirmed by Marguerite Aitoff and by Baltcano are of great interest....The clinical findings established, moreover, in man as well as in animals, the frequency of the bacterial tegument infection (almost all the human anthrax cases) or those derived of the ectoderm represented by the mucous membranes of the digestive tract, the current entrance of the infection of anthrax in animals.)